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BIRD DAMAGE TO SPROUTING RICE IN LOUISIANA: DYNAMICS OF THE MILLERS LAKE BLACKBIRD ROOST

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ABSTRACT: In spring 1986 and 1987 I examined the relationship between blackbird abundance and sequence of rice planting near a very large roost in southwestern Louisiana to identify factors that contributed to bird damage in newly planted rice fields. Millers Lake, an eutrophic man-made lake of approximately 2,500 ha, attracts a winter roosting population that peaks at 10 to 25 million blackbirds annually. By March and April the roost declines to several thousand birds. Female red-winged blackbirds (Agelaius phoeniceus) were responsible for most rice seed losses, predominating both the roost and feeding flocks in rice fields in spring. Number of flocking birds in fields decreased with roost size, date of year, and distance from the roost. Surveys corroborated recommended planting practices: planting after 24 March coincides with decreased numbers of blackbirds in rice fields, thus reducing the potential for damage to seeded rice by foraging blackbirds.

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INTRODUCTION

Rice production is a major industry in Louisiana and localized losses of rice to foraging flocks of blackbirds occur at planting and harvest. In 1987 approximately 100,0001 of rice were harvested from 210,000 ha, accounting for a $200 million rice economy in the state, which represented about 15% of the U.S. rice crop (Louisiana State University 1988). Seventy-five percent of the state's annual rice harvest is produced in 8 parishes (counties) of southwestern Louisiana; winter roosts of blackbirds are common in these parishes. Estimates for some roosts in Gulf coastal and inland localities vary from 1 to 25 million blackbirds (Meanley 1976, Wilson 1986). Predominant species include red-winged blackbirds, brown-headed cowbirds (Molothrus ater), and common grackles (Ouiscalus quiscula). All species are granivorous in winter and spring (Beal 1900). Hence, depending on timing of planting and northern migration of birds from the region, seed losses during planting season might be particularly severe.

In 1983, approximately 50% of fanners surveyed in Vermillion Parish suffered losses of sprouting rice to blackbirds (S. Linscombe, unpubl. rep.). Cost of replanting is currently estimated at $100 per ha for water-seeded crops (Zacharias & McManus 1987). Although loss of rice to birds during planting season has not been quantified, the estimated annual loss is unevenly distributed among farms. Five percent of fanners responding to a 1979 survey reported no crop losses to blackbirds; 36% estimated <5% annual loss; 44% reported 6-15% loss; 12% estimated loss to be 16-30%, and 3% reported >30% loss (H. Naquin, unpubl. rep.).

This study was initiated to obtain baseline data on population dynamics of blackbird roosts in southwestern Louisiana during the spring planting season to identify the relations among bird abundance, local flocking and movement patterns, and calendar sequence of rice planting in the region. This knowledge would aid in the development of recommendations for alternative planting schemes to alleviate rice seed losses to blackbirds. Specific objectives were to (1) describe roost dynamics by enumerating roost size, species composition, and temporal patterns of roost decline during the spring planting season; (2) estimate movement patterns of individually marked or radio-tagged birds; (3) estimate locations of foraging flocks in fields during spring; and (4) relate flock occurrence to roost, weather, and land-use activities.

METHODS

Study area

One roost, Millers Lake, was chosen as an exemplar roost for study for several reasons. It is large. It is accessible. It is close to rice fields. Most importantly, it receives year-round usage by roosting blackbirds; hence, birds are in the region throughout the rice-growing season. Millers Lake is a 2,500 ha, shallow, man-made impoundment, approximately 5 km across, located at the boundary of the piedmont and coastal plain regions in central Evangeline Parish, La. It provides irrigation water to 3,000 ha of rice fields south of the lake. Approximately 70% of the lake is covered with woody vegetation, such as buttonbush (Cephalanthus occidentalis) and tupelo (Nyssa qauatica) (Ortego 1976), and thick mats of aquatic weeds grow throughout the open water.

Annual Sequence of Rice Production in Southwest Louisiana

Rice is planted in southwestern Louisiana from late February to late April, with most fields planted between mid-March and mid-April (P. Seilhan, Louisiana Cooperative Extension Service, Crowley, La., pers. commun.). Rice is planted either by water-seeding or dry-seeding, each with variations. Rice may be aerially seeded into flooded fields at rates of 100 to 170 kg/ha, or it may be either drilled in 18- to 25-cm ro ws or broadcast dry at rates of 100 to 125 kg/ha. Dry fields are subsequently flooded after stand establishment.

Recommended planting methods to reduce losses of seed to blackbirds are to (1) plant after 24 March, (2) drill seed, or (3) water plant only where a continuously uniform flood of 5 to 15 cm can be kept on the rice (Louisiana State University Agricultural Center 1987). Additional recommendations are to block plant as many fields as possible in a given area, clear hedgerows and brush as a way to reduce nesting and loafing habitat, and deep plow stubble in autumn to bury waste grain and weed seeds.

Many farmers prefer water seeding to dry seeding because the typically wet conditions of soil during spring can delay field preparation; the preparation of the seed bed is less intensive and, therefore, less costly; and water seeding suppresses weed growth. Most varieties of medium- and long-grain rice planted in southwestern Louisiana reach harvest maturity within 120 to 135 days from planting, thus most of the first harvest occurs in August. Regrowth might produce a second crop, called ratoon rice, which can be profitable. Although growth rates are depressed in the cool weather of spring, many farmers believe that early planting results in early first harvest, which then increases the likelihood of a successful ratoon crop.

Roost counts

The number of birds returning to the Millers Lake roost was estimated 1 evening per week in late winter and early spring of 1986 and 1987. Between 1630 and 1830 h, 1 or 2 observers were stationed at the southern levee to count birds entering the lake from the south and southwest following methods of Meanley (1965), Arbib (1972), and Dolbeer etal. (1978). Because relatively few birds return to the roost from the northern pine forest (Wilson 1986) and because of limited project personnel, northern flight lines were omitted from the weekly counts. Estimates of roost size during autumn and winter of previous years were compiled from published and unpublished reports.

In clear weather, evening flights to the roost occurred principally from 30 min pre- to 30 min post-sunset. In poor weather (cold, rainy, cloudy) evening flights began up to 2 h before sunset. Because a large proportion of birds flew into the roost when visibility was poor or the light was low, species and sex composition of the roost could not be determined consistently by a widely used method of identifying single birds in flightlines (Dolbeer et al. 1978). It was especially difficult to distinguish female red-winged blackbirds from brown-headed cowbirds in poor weather or low light. To census species composition in the evening, I chose a different technique for counting species and sexes.

One minute in five, entire flocks entering the lake were identified to species and sex until it was too dark for reliable identifications. The night following a roost count, collections of roosting blackbirds were made from vegetation in Millers Lake. Composition by species and sexes at Millers Lake roost was then determined by interpolating estimates made during daylight roost counts and collections made at night based on the assumptions of random spatial and temporal distribution of birds.

Distribution Patterns of Birds in Fields

Radio-tracking. During 17-19 March 1986, 6 red-winged blackbirds (1 after-second year [AS Y] male, 2 second year [SY] males, 3 after-hatching year [AHY] females) were each outfitted with a SM-1 transmitter, 0.312 Hg power cell, and whip antenna (AVM Instrument Co., Livermore, Ca.). All birds were captured at the same location east of Millers Lake. Anticipated battery life was calculated to be 9 to 14 days. Consistent attempts were made to determine daily roost locations and morning feeding locations approximately 30 min/d for each bird; however, birds were regularly lost to reception because signal range was only approximately 0.4 km.

Flock and land-use surveys. In 1986 and 1987 morning flightlines of birds from the roost were followed during the first week of March to estimate flight directions and destinations. Additionally, 2 32-km road survey routes were established to assess spatial distributions of flocks and temporal changes in flock size and composition. One route, located from 0 to 15 km directly south of Millers Lake, was carried out in March and April 1986 and 1987. The second, 30 to 55 km southwest of the lake, was conducted during March and April 1987. Flocks and territorial birds observed during 3 min within 0.4 km of the road were counted at each of 20 stops located at 1.6-km intervals on each route. Surveys, which began approximately 30 min after sunrise, were conducted simultaneously in 1987. Land-use patterns were quantified twice per month in 1987 by mapping all land-use activities within 0.4 km of either side of survey routes, for a total of 12.8 km^2. Five categories of land use were designated: out-of-rice production, disked, water planted, drill planted, and seedling stand established.

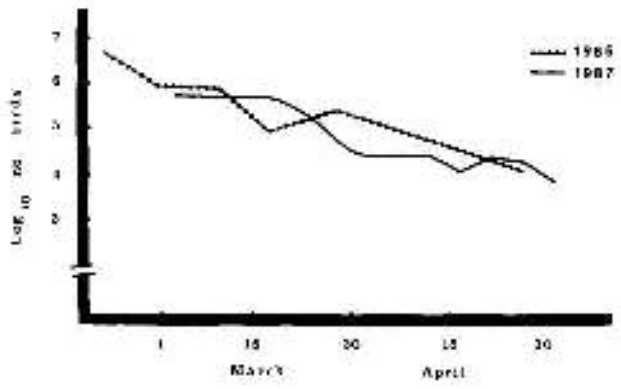
Spearman-rank correlation was used to estimate relationships between $\log_{10}$ transformed roost size and the number of flocking birds found feeding in fields. Wilcoxon matched pairs t-test was used to test for differences between survey routes in total number of flocking birds, mean flock size, and number of flocks. Multiple linear regressions (S AS Institute, Inc. 1985) were used to estimate relations among flock occurrence (number of flocks, total number of birds observed), roost size, distance to the roost, number of days into planting season after March 1, weather, and land-use patterns.

RESULTS

Roost size and composition

Previous reports documented year-round roosts at the lake. Peak numbers of 10 to 25 million birds occur from December to February, and lows of 2,000 to 10,000 occurred in summer (Ortego 1976, Wilson 1986). In spring 1986, the number of blackbirds using the roost decreased geometrically from approximately 15 million in February (E. A. Wilson, Louisiana State University, Crowley, La., pers. commun.) to 15,000 in late April (Fig. 1). A similar pattern of decline was observed in 1987. Roost size (log 10) and time (number of days into the planting season after 1 March) were correlated both years (1986: $r = -0.94$, $p < 0.01$; 1987: $r = -0.93$, $p < 0.01$).

Fig. 1. Number of blackbirds estimated to roost at Millers Lake,



Evangeline Parish, LA, during spring, 1986 and 1987.

Icterine species composition at Millers Lake varies by month. Wilson (1986) documented that cowbirds were proportionally most abundant in December and January. However, female redwings were most abundant in roost counts and collections made during March and April, comprising 70% to 99% of birds identified (Table 1).

Distributional Patterns of Birds

Radio-tracking. Birds were detected no farther than 8 km from the capture site during 11 days of tracking (Table 2). The ASY male remained away from flocks in an irrigation canal 1 km east of Millers Lake for the first 7 days and nights, then returned to the roost the evening after a nearby field was disked for rice planting. His signal was lost for 3 days until it was detected for the last time at night in the east portion of Millers Lake. One SY male was detected for 2 mornings in feeding flocks east of Millers Lake. Thereafter, no daytime locations were obtained. The second SY male moved daily with foraging flocks 1 to8km south and south west of the roost. Both SY males returned to Millers Lake at night.

Radio contact with the 3 AHY females was maintained between 17 and 24 March. One bird fed with flocks east of the lake and roosted in the northeastern portion of the lake each night. The second female was recorded roosting near the lake the first night, then spent subsequent days and nights in fallow fields < 2 km from the lake. No flocks were observed in her vicinity, so she may have been a solitary bird. The third female was detected intermittently in feeding flocks east of the lake during the day, but roosted at Millers Lake each night.

Flock and land-use surveys. Flocks were followed up to 60 km southwest of Millers Lake before being lost to view. The total number of flocking birds observed per survey was significantly correlated with roost size in 1987 (northern survey: $r = 0.71, p = 0.03$; southern survey: $r = 0.81, p = 0.01$),

Table 1. Percentage composition by species and sex of blackbirds at Millers Lake roost, Evangeline Parish, LA, summarized for 4 counts per month during March and April, 1986 and 1987. Two methods were used to estimate composition: counts of flocks entering the lake during late afternoon and collections of birds made from vegetation in the lake at night. Only predominant species are listed: red-winged blackbird (RWBL); brown-headed cowbird (BHCO); common grackle (COGR); and great-tailed grackle (GTGR).

Date	Method	Species (sex)				
		RWBL (females)	RWBL (males)	BHCO (both)	COGR (both)	GTGR (both)
1986 March	count	72	8	**5**	8	5
	collect					
April	count	89	9	1	1	0
	collect					
1987 March	count	95	2-5	<1	<1	<1
	collect	83	16	0.5	0.5	0
April	count	96-99	<1	<1	<1 0	<1
	collect	81	18	0		0

Table 2. Summary of movements of 6 radio-tagged red-winged blackbirds followed between 17 and 28 March 1986 in Evangeline Parish, LA. All birds were captured 1 km east of Millers Lake. Evening roost locations were determined between 1800 and 2000 h. Daytime feeding locations were determined between 0700 and 0900 h.

Sex	Age	Span of dates found	Maximum distance to capture site (km)	Number of days found	Number of nights found	Number of nights in roost	Found with flocks
M	ASY	3/17-28	1	7	8	2	no
M	SY	3/19-25	2	2	3	3	yes
M	SY	3/19-28	8	4	7	7	yes
F	AHY	3/17-24	5	4	6	6	yes
F	AHY	3/17-23	6	5	2	1	no
F	AHY	3/17-24	2	3	4	4	yes

*ASY = after second year, SY = second year, AHY = after hatching year.

but showed only a trend of correlation in 1986 (northern survey: $r = 0.71$, $p = 0.055$). In the 1987 paired surveys, more birds were found in rice fields close to than far from the roost ($t = 2.19$, $p < 0.02$) (Table 3). Flocks were often segregated by sex. Sex ratios of total number of birds per route were female-biased in all northern surveys and in southern surveys during March. Among survey dates, mean flock size declined significantly with distance from the roost ($t = 2.34$, $p < 0.01$). Mean flock size declined with decreasing roost size and increasing number of days into the planting season (Table 3).

During the years of field surveys, approximately 93 % of land along the northern route and 85% of land along the southern route were planted to rice. In 1987, field preparation and rice planting began earlier close to Millers Lake than it did in more distant fields (Table 4).

No single factor in the multiple regression analysis explained significant variation (i.e., > 60% of the total variation) associated with flock occurrence at survey stops. Roost size and distance from the roost were the best explanatory independent variables, yet together explained only 15% of variation in number of birds observed per survey stop.

DISCUSSION

Meanley et al. (1966) described 15 December to 31 January as a stable roosting period in the southern rice belt, based on returns of blackbirds banded by the U.S. Fish and Wildlife Service. They reported that, during winter, > 80% of blackbirds in the southern rice states were from northern breeding areas and that approximately 50% of the redwings, cowbirds, and grackles in eastern North America winter in rice states. He showed that migrants leave southern roosts in mid-February to early March.

Roost size at Millers Lake declined markedly in late February, particularly for male redwings and both sexes of cowbirds and grackles, suggesting that migration from southwestern Louisiana follows the pattern predicted by Meanley et al. (1966) for all southern rice states. An alternative explanation for the decline in number of birds at Millers Lake roost is that birds remain in the area but no longer roost there as spring progresses. Instead they might roost in outlying areas, either in smaller flocks or singly. This explanation is not borne out by correlations between declines of roost size and the total number of birds observed in rice fields during road surveys.

In early March, feeding flocks found as far as 60 km from Millers Lake might have roosted at the lake, suggesting that the roost might affect 5650 km^2 of farmlands during early spring. Daily movements of redwings in this region are poorly understood. Results of radio tracking suggested that tagged redwings foraged in local areas for several days then moved on, similar to starlings that feed in daily activity centers (Morrison and Caccamise 1985). However, because radio signals were often lost and tracking efforts were discontinuous, birds may have moved more often or farther than could be detected. Alternatively, the short radius of movement identified in this study might reflect a problem of poor adjustment by birds to transmitters.

Total number of flocking birds observed per survey route declined with roost size and distance from the roost. However, the number of flocking birds at each stop along survey routes was not well explained by roost size, distance, local land-use activities, or weather patterns. Because of high mobility of flocking birds, it might not be possible to predict exact occurrence of flocks by these variables. Other factors not considered in this study, such as harvest history, seed density in fields, previous flock foraging history in fields, and large-scale land-use patterns, might be more relevant to predicting numbers and specific locations of flocking birds. Compared to previous years, rice was planted in Evangeline Parish later in the springs of 1986 and 1987, and rice losses to blackbirds were less severe in fields near the roost (A. Mire, Louisiana Cooperative Extension Service, Ville Platte, La., pers. commun.). The temporal decline in roost size at Millers Lake and in number of flocking birds in rice fields corroborates recommended planting practices; planting after 24 March each year results in decreased numbers of foraging flocks of blackbirds in rice fields (Wilson et al. 1986). However, proximity of rice fields to a late winter roost such as Millers Lake remains a liability in that a few large flocks might remain throughout the planting season.

Table 3. Number of red-winged blackbirds observed in 2 road surveys conducted in Evangeline Parish, LA, in March and April 1987. The northern survey ranged from 0 to 15 km from Millers Lake; the southern survey was 30 to 55 km from the lake. The first day of planting season is designated 1 March.

Date	Days into planting	Total number of birds	Total number of flocks	Mean number of birds/ stop (SD)	Mean number of birds/ flock	RWBL sex ratioM:F
Northern	Survey					
9Mar	9	15,229	55	762(1,452)	276	1:2.3
16 Mar	16	4,875	62	245 (356)	77	1:3.5
23 Mar	23	5,510	35	271 (671)	155	1:5.7
29 Mar	29	5,954	38	294 (537)	155	1:7.8
6 Apr	37	1,053	34	47 (61)	28	1:3.8
13 Apr	44	723	33	31 (60)	19	1:2.6
21 Apr	52	704	25	30 (122)	24	1:2.6
Southern	Survey					
9 Mar	9	3,870	62	188 (268)	62	1:2.5
16 Mar	16	3,516	55	174 (359)	63	1:9.1
23 Mar	23	676	59	31 (45)	10	1:1.4
29 Mar	29	1,177	30	56 (116)	37	1:2.1
6 Apr	37	1,173	53	55 (130)	21	3:1
13 Apr	44	372	37	13 (16)	7	2:1
21 Apr	51	173	29	4 (8)	3	6:1

Table 4. Area (ha) of farmed land within 0.4 km of each side of 2 survey routes in each of 5 stages of rice production during spring, 1987: out of production (out), disked, flood planted, drill planted, and seedling stand established. Total area surveyed in each route was 12.8 km^2; approximately 11.9 km^2 along the north route (N) and 10.9 km^2 of the south route (S) were in rice.

Date	Survey	Flood Out	Drill Disked	Flood planted	Seedling planted	Seedling stand
10 Mar	N	91,630	22,610	4,760	0	0
	S	103,550	545	4,905	0	0
23 Mar	N	79,730	15,470	23,800	0	0
	S	90,470	0	18,530	0	0
6 Apr	N	58,310	32,130	11,900	8,330	8,330
	S	63,220	27,250	13,080	327	5,123
21 Apr	N	47,600	29,750	11,900	3,570	26,180
	S	52,000	29,430	7,630	320	19,620

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